CLAIMS

1. A particle comprising a core surrounded by a shell which comprises a plurality of nanoparticles of a magnetic material, the shell being surrounded by a continuous outer shell which comprises a non-magnetic material.

2. A particle according to claim 1, wherein the core size is in the range of from 50 nm to 10 μm.

3. A particle according to claim 1 or 2, wherein the core comprises a non-magnetic material.

4. A particle according to any one of the preceding claims, wherein the core comprises at least one of silicon dioxide, titanium dioxide, yttrium oxide, yttrium basic carbonate, hematite, alumina and a silicate.

5. A particle according to any one of the preceding claims, wherein the thickness of the shell of nanoparticles of magnetic material is in the range of from 2 nm to one fifth of the core size.

6. A particle according to any one of the preceding claims, wherein the shell comprises a monolayer of nanoparticles.

7. A particle according to any one of the preceding claims, wherein the magnetic material comprises one or more selected from the group consisting of iron, cobalt, nickel, magnetite, maghemite and ferrite.

8. A particle according to any one of the preceding claims, further comprising an inner shell between the core and the shell of nanoparticles of magnetic material.

9. A particle according to claim 8, wherein the thickness of the inner shell is in the range of from approximately 1 to 3 nm.

10. A particle according to claim 8 or 9, wherein the inner shell comprises at least one layer of polyions.

11. A particle according to any one of claims 8, 9 or 10, wherein the inner shell comprises a plurality of layers of polyions, and wherein the polyions of successive layers are of alternating polarity.

12. A particle according to any one of claims 8 to 11, wherein polyions comprising the inner shell are derived from one or more polyelectrolytes selected from the group consisting of poly(diallyldimethyl ammonium chloride), poly(sodium styrene sulfonate), polyallylamine hydrochloride, and polyethylenimine.

13. A particle according to claim 12, wherein the thickness of the outer shell is in the range of from approximately 1 to 200 nm.

14. A particle according to claim 12 or 13, wherein the outer shell comprise at least one of silicon dioxide, titanium dioxide, yttrium oxide, yttrium basic carbonate and a silicate.

15. A particle according to any one of the preceding claims, further comprising a coating over the outer shell selected from the group consisting of a metal and a luminescent material.

16. A particle according to claim 15, wherein said metal comprises gold.

17. A particle according to claim 15, wherein said luminescent material comprises yttrium oxide doped with europium.

18. A particle according to any one of the preceding claims, comprising a plurality of shells of nanoparticles of magnetic material.

19. A 1D chain comprising a plurality of particles according to any of the preceding claims.

20. A process for preparing a magnetic particle comprising:

a first step of providing a core;

a second step of adsorbing an inner shell to the core;

a third step of providing a plurality of nanoparticles of a magnetic material;

a fourth step of adsorbing the nanoparticles to the inner shell; and

a fifth step of providing an outer shell surrounding the particle.

21. A process according to claim 21, wherein the fourth step is carried out using a short-chain alcohol or water as solvent.

22. A process according to claim 22, wherein the solvent is ethanol.

23. A process according to claim 20, 21 or 22, wherein the fourth and fifth steps are carried out using the same solvent.

24. A process according to any one of claims 20 to 23, wherein the fifth step is carried out under ultrasonic agitation.

25. A process according to claim 24, wherein the ultrasonic agitation is at a frequency in the range of from approximately 40 to 80 kHz.

26. A process according to any one of claims 20 to 25, wherein the second step comprises adsorbing polyions provided from a solution of polyelectrolyte and an inorganic salt.

27. A process according to any one of claims 20 to 26, wherein the second step comprises layer by layer growth of polyions of alternate polarity to form the inner shell.

28. A process according to any one of claims 20 to 27, wherein said fourth step comprises mixing a solution of coated core particles derived from the second step with a solution of nanoparticles of magnetic material, wherein the number of core particles and number of nanoparticles in said mixed solutions are calculated such that substantially complete coverage of each core particle with a shell of nanoparticles is enabled.

29. A process according to any one of claims 20 to 28, wherein in said fifth step the amount of material to form the outer shell is calculated taking into account the desired thickness of the outer shell and the space between the nanoparticles of magnetic material.

30. A process according to any one of claims 20 to 29, wherein the fifth step comprises using a sol-gel method to produce the outer shell.

31. A process according to any one of claims 20 to 30, further comprising forming a functional coating surrounding the outer shell of the particle.